

U.S. NAVAL BASE, PEARL HARBOR, FORD ISLAND 5-INCH
ANTIAIRCRAFT BATTERY

HAER No. HI-85

(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
Pearl Harbor
Honolulu County
Hawaii

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

U.S. Department of the Interior
National Park Service
Oakland, California

HISTORIC AMERICAN ENGINEERING RECORD

U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTIAIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Air Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)

HAER No. HI-85

Location: Ford Island
Pearl Harbor National Historic Landmark
City and County of Honolulu, Hawaii

USGS 7.5 minute series topographic map, Pearl Harbor, HI, 1999.
The three features discovered that are associated with this antiaircraft battery are contained within the area bounded by Universal Transverse Mercator (UTM) coordinates:
04.608410.2363090
04.608380.2363070
04.608380.2363090.

Date of Construction: 1942-1943

Designer: Honolulu District Engineer, U.S. Army Corps of Engineers.

Builders: Navy provided initial construction work force – personnel from vessels damaged in the Pearl Harbor attack. Battery was completed by Honolulu District Engineer, U.S. Army Corps of Engineers.

Owner: United States Navy

Present Use: Abandoned, re-covered with earth.

Significance: This antiaircraft battery command center and its gun emplacements are associated with the hasty construction of nine 5-inch antiaircraft defensive positions in the months after the 7 December 1941 Japanese attack on Pearl Harbor, when an invasion of Oahu was thought to be imminent. Some of the 5-inch guns and gun directors used in the batteries were salvaged from ships damaged and/or sunk during the attack, possibly including the 5-inch guns of this battery.

Prepared by: Dee Ruzicka
Architectural Historian
Mason Architects, Inc.
119 Merchant Street, Suite 501
Honolulu, HI 96813

Date of Report: November 2008

DESCRIPTION

During excavations for utility lines associated with new housing on Ford Island, which lies within the Pearl Harbor National Historic Landmark, the remains of three structures (one command center and two gun emplacements for 5-inch¹ antiaircraft guns) were unearthed. These three structures comprise a portion of an antiaircraft battery, one of nine that were constructed during the months after the Pearl Harbor attack. Some of these antiaircraft shore batteries used 5-inch guns that were salvaged from Navy ships damaged or sunk during the attack. The three structures were discovered at the north end of Ford Island. The roads in this portion of the island have been altered numerous times in recent years. These structures were unearthed at a location approximately 500' east of the current traffic circle at the intersection of Ford Island, Chaffee, and O'Kane Boulevards. They had been covered by about three to four feet of overburden. The surface above the three structures had recently been paved or planted with landscaping, due to the construction of a different traffic circle, around the time of the opening of the Admiral Clarey Bridge in April 1998.

For descriptions of each of the three structures unearthed, see their associated HAER report:

HAER HI-85-A, U.S. Naval Base, Pearl Harbor, Ford Island 5-Inch Antiaircraft Battery, Battery Command Center.

HAER HI-85-B, U.S. Naval Base, Pearl Harbor, Ford Island 5-Inch Antiaircraft Battery, East Gun Emplacement.

HAER HI-85-C, U.S. Naval Base, Pearl Harbor, Ford Island 5-Inch Antiaircraft Battery, South Gun Emplacement.

HISTORICAL CONTEXT

Heavy Antiaircraft Gun Batteries on Oahu after the Pearl Harbor Attack

The atmosphere on Oahu immediately after the Japanese attack on Pearl Harbor of December 7, 1941 was "frantic" with military administrators "anticipat[ing] additional air raids and even a Japanese invasion."² The day of the attack, Lt. General Walter Short persuaded Hawaii Governor Poindexter to declare martial law that afternoon, claiming that Japanese landing parties might already be on the way.³ During the coming months, work was undertaken throughout the base to prepare for another attack. Air raid shelters were built, fuel tanks camouflaged, windows painted for blackout, and ships moored in the harbor were protected from torpedo attack by rafts with suspended steel plates or nets. Repercussions of the attack also included recognizing the importance that airpower could play in modern naval warfare and "dramatically alter[ing] concepts concerning the capital ship as an instrument of war and an

¹ Navy guns are designated by their bore diameters. Because this term is used as a type description, it is written as 5-inch, rather than using the quotation marks (5") employed for measurements in inches.

² Erwin N. Thompson, *Pacific Ocean Engineers: History of the U.S. Army Corps of Engineers in the Pacific, 1905-1980* (U.S. Army Corps of Engineers, 1985), 108.

³ Richard Borreca, "Marital Law Held Sway in Isles for Three Years," *Honolulu Star Bulletin*, 13 Sept. 1999.

U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 3)

index of national power."⁴ Defense against air attack was immediately viewed as having the utmost importance. With Japanese troop landings in the Philippines, Borneo, and Wake Island in December 1941, the United States military felt that other attacks and an invasion of Oahu would be Japan's next moves in Hawaii.⁵ The air defense of Pearl Harbor seemed crucial.

Only two days after the attack numerous vessels were recognized as beyond repair and it was recommended that the battleships *Arizona* and *West Virginia* be stripped of "anything useful."⁶ Enemy aircraft were seen as one of the most substantial threats to the safety of the naval base. Ships that were crippled and dead in the waters of Pearl Harbor (such as *Nevada* and *California*) were supplied with power from shore or from salvage ships to maintain their 5-inch/25 antiaircraft batteries and machine guns.⁷ Guns on the *California* which were in danger of becoming submerged as the ship settled (such as the port side secondary battery of 5-inch/51 guns) began to be removed by the evening of 09 December.⁸ On the following day all accessible ordnance was ordered removed from the ship, including six 5-inch/25 guns, ready ammunition lockers, and gun directors.⁹ Eight 5-inch/25 guns were similarly removed from the *West Virginia*, four of which were ultimately set up as a naval antiaircraft shore battery at West Loch.¹⁰ The remaining 5-inch guns from that vessel were installed to replace those damaged on other ships. Although recovery efforts on the upper levels of the *West Virginia* proceeded with haste, viable resources on the flooded lower decks remained out of reach. Three men trapped in storeroom A-111 below decks remained alive until 23 December, marking off their last days on a small calendar.¹¹

Salvaging antiaircraft weapons from the ships damaged in the Pearl Harbor attack received high priority. Heading the initial salvage efforts was Commander James M. Steele, who was assigned the task after the loss of his ship, the USS *Utah*. On 20 December 1941, in a memorandum issued by the Base Force Salvage Organization, the recovery of antiaircraft guns was listed as third highest priority of fourteen items, after removing the main gun battery from the *California*, and removing the capsized *Oklahoma* from its F-5 mooring berth at battleship row.¹² The high priority of removing *California*'s main gun was not for re-use, rather to immediately lighten the vessel to prevent it from settling deeper in the mud at mooring F-3. Mark 19 gun directors (used to accurately fire the 5-inch/25 antiaircraft guns at a target) were removed from ships and overhauled aboard the repair ship *Medusa* which required about four months labor for each director.¹³ Amazingly, useable gun batteries were salvaged from the *Arizona*, including 5-inch/25 antiaircraft guns and directors. The ship was abandoned on 29 December 1941. On 7 January 1942, survey work began on the *Arizona* to recover her 14-inch guns. Work continued during February and March 1942, and *Arizona*'s 14-inch guns and turrets

⁴ E.R. Lewis and D.P. Kirchner, "The Oahu Turrets," *Warship International* (Vol. xxix, No. 3, 1992).

⁵ Daniel Madsen, *Resurrection: Salvaging the Battle Fleet at Pearl Harbor*, (Annapolis: Naval Institute Press, 2003), 113.

⁶ Ibid., 30.

⁷ Ibid., 35.

⁸ Ibid., 57.

⁹ Ibid., 58.

¹⁰ Ibid.

¹¹ Captain Homer N. Wallin, "Report of Salvage of USS *West Virginia* (BB-48)," 15 June 1942, from website www.history.navy.mil/docs/wwii/pearl/salvagewv.htm, accessed on 17 October 2007.

¹² Madsen, *Resurrection*, 63.

¹³ Ibid., 79.

U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 4)

at positions 3 and 4 were removed for refurbishing and installation at shore batteries. In late January 1942 divers made the last attempt to remove bodies from the inner spaces of the hull. These had disintegrated; only forty-five bodies were recovered before abandoning the ghastly task and leaving the remaining crew where they lay. At the end of December, a 5-inch/38 mount was removed from the *Downes* and sent to the antiaircraft battery at Ewa, which also received a gun director, rangefinder, and loading machine from the *Cassin*.¹⁴ Although most of the nine 5-inch/38 guns taken from these two ships were thought to be beyond repair, one from the *Cassin* was later installed at the number 3 gun position of the *Shaw* for its voyage to Mare Island shipyard.¹⁵ Salvage efforts at the USS *Utah* yielded much ammunition, over 1200 rounds for 5-inch/25 and 600 rounds for 5-inch/38 guns.

"Immediately after the Japanese attack, Army and Navy officials agreed to salvage guns from the damaged ships in Pearl Harbor and to transfer other surplus naval guns to the Coast Artillery."¹⁶ The armament which was to have been transferred included 5-inch guns, 7-inch naval broadside guns, and 8-inch turrets. The complexities of installing these weapons in shore batteries increased with the size of the guns. The turrets apparently involved more extensive construction, and as the war moved west and threats to Oahu diminished, some of those planned were never completed. Mounting the 5-inch guns "on steel and concrete bases" was a much simpler operation. These batteries were valued -- for their protective fire and because they freed up the available mobile artillery units for deployment elsewhere.¹⁷

Soon after the Japanese attack, nine emergency antiaircraft batteries were proposed for construction surrounding Pearl Harbor. These antiaircraft batteries consisted of naval 5-inch/25 and 5-inch/38 guns.¹⁸ Both of these types of guns were considered dual-purpose because they are large enough to successfully engage surface targets, but were also used to engage aircraft because of good traverse and elevation capabilities of their mounts and a high rate of fire.

In 1942 and 1943, nine supplemental antiaircraft batteries equipped [typically] with [four] naval 5-inch/25 caliber A.A. guns each, [except] one battery equipped with four 5-inch/38 caliber naval dual purpose guns, were built to protect the Pearl Harbor and Honolulu Harbor complexes. The four early batteries were equipped with guns that had been removed from sunken or badly damaged battleships (5-inch/25s) and destroyers (5-inch/38s). Naval personnel built the first four and started work on several others, and were relieved by the Army Corps of Engineers who incorporated design changes from the original four batteries that included reinforced concrete emplacements with perimeter walls and built-in ammunition lockers and storage spaces, and splinterproof support buildings.¹⁹

¹⁴ Ibid., 102.

¹⁵ Ibid., 106, 128.

¹⁶ Thompson, *Pacific Ocean*, 113.

¹⁷ Ibid., 114.

¹⁸ Naval weapons can be designated both by their bore diameter; in this case 5 inches, AND by the length of the barrel -- expressed in the number of calibers, or bore diameters, of the weapon. Thus, the 5-inch/25 gun has a barrel length of 125 inches (5 x 25 = 125) and the 5-inch/38 gun has a barrel length of 190 inches (5 x 38 = 190).

¹⁹ John D. Bennett, memorandum to Ann Yoklavich, Mason Architects, 20 July 2007.

U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 5)

Table of the nine emergency naval gun anti-aircraft batteries at Pearl Harbor.

Bat. #	Battery Location	Completion date*/ or expected completion date	Built or contracted by	No. & Type of guns -- other equipment	Guns taken from
1	Hickam Field	9 FEB 1942 *	Navy	Four 5"/25 -- Mk 19 gun director	<i>California</i>
2	West Loch	9 FEB 1942 *	Navy	Four 5"/25	<i>West Virginia</i>
3	Puuloa	MAY 1942 *	Navy	Four 5"/25	
4	Ewa Marine Corps Air Station	early 1942 *	Navy	Four 5"/38 -- Mk 33 gun director	1-Downes, 3-Shaw, Mk33 director-Cassin
5	Ft. Kamehameha	9 APR 1942	Navy & Army	Four 5"/25	
6	Waipio	26 NOV 1942	Navy & Army	Four 5"/25	
7	Ford Island	11 MAY 1943	Navy & Army	Four 5"/25	
8	Aiea Heights	26 OCT 1942 *	Army	Four 5"/25	
9	Sand Island	15 OCT 1942	Army	Four 5"/25	

(summary of information in Bennett February 2007 and in NARA RG 494, West, Lt. Col. Melbourne H. documents from Bennett)

5-Inch Antiaircraft Guns and Directors

The 5-inch/25 naval gun was the first heavy weapon specifically designed for anti-aircraft use. This was achieved by giving the weapon a light-weight mount and a short barrel which enabled it to be moved very quickly, a desirable trait when tracking a fast-moving airplane. The 5-inch/25 had a marked improvement over the training speed of the previous 5-inch/51 gun that was used primarily as an anti-torpedo boat weapon. The 5-inch/25 was mounted on capital ships and cruisers that were outfitted between 1926 and 1940. Various versions of this weapon were developed. Primary differences were the method of securing the barrel to the (housing) frame, alterations to the housing for easier loading, and chrome-plated bores. Versions were produced which could be immersed, for use on submarines. Although the 5-inch/25 projectile had a lower muzzle velocity than the 5-inch/51 it was designed to replace, its good handling and high rate of fire (15-20 rounds per minute) also made it a favored weapon for firing on surface targets at shorter ranges, up to 6000 yards.²⁰

The 5-inch/25 guns most commonly used the Mark 19 naval gun director for accurate aiming on incoming aircraft. When this director was first installed in 1928 it was the only effective director for 5-inch anti-aircraft guns. Until this director was developed there was no means of precision firing a large-caliber anti-aircraft gun at a target aloft; anti-aircraft firing was done by laying down a barrage of fire in the path of the target. The Mark 19 director allowed the 5-inch/25 gun to fire an exploding shell into the lethal range of an aircraft target. Although superseded by Mark 28 and Mark 33 directors which rendered the earlier version obsolete by 1943, Mark 19 directors were noted as having been aboard the USS *Oklahoma*, *California*, and the *Pennsylvania* in 1939. Moreover, Mark 19 directors were "not replaced until well after the outbreak of war."²¹ All

²⁰ Norman Friedman, U.S. Naval Weapons: Every gun, missile, mine, and torpedo used by the U.S. Navy from 1883 to the present day, (Annapolis: Naval Institute Press, 1982), 63-64.

²¹ Ibid., 81-82.

U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 6)

of those ships were present at Pearl Harbor on 7 December 1941, and some of their directors were removed for use in the anti-aircraft batteries.

A single gun director aims a battery of guns; it collects target data and computes and transmits the solution to hit the target (including the required gun elevation, training, and fuse and sight settings) to the fire control switchboard where it is relayed to the individual guns. The Mark 19 director required an operator to visually track a target and the machine then estimated its distance, speed, altitude, and direction of travel using an optical rangefinder (in 1940 a stereo rangefinder with blast shield was fitted to the Mark 19). The target data was supplied to a rangekeeper, or analog computer in the director; this calculated future positions of the target, using cams contoured according to the ballistics of the 5-inch/25 round, to determine a firing solution. These positions and solutions were sent, via the fire control switchboard, to the guns as aiming coordinates and as settings for the time-fused projectiles to ensure they exploded at the correct range. At the gun, the operators kept their controls continuously matched to the coordinates supplied by the director in order to remain constantly on target and ready to fire. When the gun controls were not matched with the coordinates from the director, firing circuits at each gun were held open, to prevent firing when the guns were not aimed correctly. At sea, the directors were protected by shields which varied from thin (to provide only weather protection) to 1½" thick steel.

The Mark 33 directors (installed on ships beginning in 1934) were power driven and used more complicated internals than the Mark 19 in order to target faster-moving aircraft. These elements, as well as an improved rangefinder, heavier shielding, and later retro-fitting of radar, added weight. Because the director moved and pivoted when tracking its target, it had similar inertia problems as the guns it directed; keeping the weight low was crucial to its ability to track fast targets. The greater mass of the Mark 33's improvements had reached the current limits of design for a fast-moving director. Later systems (Mark 37, first tested in 1939) were designed from the start to employ radar and separated the computer from the director by placing it below decks, which resulted in a lighter unit and also afforded protection to that critical component.²²

On the left side of each of the 5-inch/25 guns was a mechanical fuse setter which held three rounds of ammunition. The 5-inch/25 rounds were placed, nose down, into slots in this device. A lug on the moveable ring of the time fuse in the nose of the projectile was engaged by a pawl of the fuse-setting device. The fuse-setting crewman watched a dial on the mechanical fuse setter that had two pointers. A signal from the fire control switchboard moved the first pointer to the fuse setting that was calculated from the information received from the gun director as the correct time setting to hit the target. The second pointer represented the setting that was applied to the time fuse by the mechanical fuse setter. The fuse-setting crewman moved this second pointer to match the first, and the machine rotated the movable ring to the indicated setting. The rounds in the mechanical fuse setter were now calibrated to the time they would spend in flight in order to explode near the target and bring it down. Because the target aircraft were always moving at a high speed, the target information from the gun director and fire control switchboard was constantly changing. The three slots in the mechanical fuse setter gave enough time for each round to receive the proper setting before it was taken from the machine and dropped into the loading tray of the gun. The shell man, who removed the round from the fuse setting machine and placed it in the gun, was instructed to wait until the last possible

²² Ibid., 82-83.

U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 7)

moment to remove the round, in order that the best updated setting was on the projectile. The fire control calculations from the switchboard allowed for the time it took to remove the round from the machine and fire it.

The operators responsible for aiming the 5-inch/25 guns also used two pointers, similar to the fuse setter. The operator moving the gun in azimuth, or bearing (between its left and right limits) was called the trainer, and the operator moving the gun in elevation was called the pointer. Seated on opposite sides of the gun (trainer on the right side and pointer on the left), each operator observed an indicator hand on a dial with either bearing or elevation information that was transmitted from the fire control switchboard. Each operator had to move a second indicator (which corresponded to the actual direction the gun was aiming) to match the first. When each operator's two indicators were in alignment, the gun was on target and could be fired. The trainer and pointer could also have manual control of aiming the gun, necessary in the case of damage to the director or fire control switchboard. The aiming information from the fire control switchboard and the actual elevation and training position of the gun from the trainer's and pointer's stations was relayed to another set of dials monitored by the "sight setter." This crewman was responsible for ensuring that all indicators matched up before the gun was fired.

5-Inch Naval Antiaircraft Shore Batteries on Oahu

Battery number 4, located near the dirigible mooring mast at the Ewa Marine Corps Air Station, was equipped with 5-inch/38 guns and a Mark 33 gun director. The 5-inch/38 gun was designed as a replacement to the 5-inch/25 and was installed on warships from 1934 through the end of the war. Its very successful design made it an outstanding dual-purpose (antiaircraft and surface fire) weapon. A major difference between the 5-inch/38 and its predecessor, the 5-inch/25, was the use of semi-fixed ammunition in the later design. This employed two components, the 5-inch projectile and a separate casing which contained the propellant charge. During gunnery trials in 1941 the 5-inch/38 was able to hit target aircraft at altitudes (12,000 to 13,000 feet) which were about double the range of the 5-inch/25 antiaircraft guns.

The Navy and the Honolulu District Engineer of the U.S. Army Corps of Engineers shared responsibility for construction of these batteries, which included emplacements for the guns themselves as well as structures for ammunition, fire control, and generators.²³ Work on the nine batteries was begun by navy personnel, who completed the first four batteries and started work on others, according to a circa 1942 untitled tabulation from the Hawaiian Department Engineer files provided by John Bennett. In February 1942, work was turned over to the Army Corps of Engineers, who completed or contracted for the construction of the remaining batteries. The batteries were initially manned by sailors from ships which were put out of action due to damage from the Japanese attack. A crew from the *California* manned battery number 1 at Hickam Field until it was taken over by gunners from the coast artillery.²⁴ This battery (number 1, at Hickam) used guns and a gun director salvaged from the *California*. Battery number 3 at Puuloa was used as the training battery where coast artillery personnel were schooled by navy gunners to learn the operation of the navy guns.²⁵

²³ John D. Bennett, "Oahu's World War Two 5-Inch Naval Antiaircraft Shore Batteries," *The Coast Defense Journal* (February 2007): 34.

²⁴ *Ibid.*, 46.

²⁵ *Ibid.*, 48.

U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 8)

Work on the batteries included building emplacements for the individual guns and shelters for the equipment used to direct the firing of the guns, and for ammunition. Typically, an anti-aircraft battery of this type would include four 76-ton gun blocks of reinforced concrete with projecting bolts to which the guns were attached. The first of these gun emplacements were protected by sandbags which were stacked around the gun blocks and then covered with gunite concrete. Stacked sandbags were also initially used as retaining walls at the perimeter of the gun emplacements. Later, concrete retaining walls were constructed. Splinterproofing was intended to protect against bullets and blast fragments (shrapnel) and generally consisted of "12-inch reinforced concrete construction."²⁶ In addition to a shelter for the gun director, splinterproofing protected other gun equipment and supplies. The battery command centers, generator rooms, air compressor (or air bottle storage) rooms, fire control switchboard rooms, and reserve ammunition magazines were all of splinterproof construction.²⁷ (Bennett February 2007).

Of the nine 5-inch naval anti-aircraft shore batteries constructed on Oahu during World War II, the battery at Ford Island was the last to come on-line. The other eight batteries were either completed or were substantially complete by the end of 1942. The Ford Island 5-inch battery was listed as Battery No. 7 in several Army documents from National Archives Record Group 494, provided by John Bennett. Construction of the 5"/25 battery at Ford Island was begun by the navy and completed by army engineers,²⁸ under Work Order 600.118-B-102.0 which was dated 3 May 1943.²⁹ It was essentially complete at its last known inspection, on 11 May 1943 except for a concrete compressor block, two air compressors, and connecting the fuel tank for the generator. This inspection came only about a month before it was decided that no new (stronger) replacement bunkers should be constructed for the 5-inch anti-aircraft batteries, pending the guns' future replacement by 90mm weapons.³⁰ It is not known if any of the 5-inch batteries were replaced by new weapons. The dates of abandonment and covering over of this battery command center are also unknown.

SOURCES

A. Architectural Drawings:

No drawings of the anti-aircraft battery were located for this report.

B. Early Views:

Aerial photos of Ford Island taken during the war are available at the Hawaii State Archives, Admiral Furlong Collection. An aerial photo showing the gun position in January 1943 (#80-G-451261) is available at National Archives II, College Park, MD.

²⁶ Lt. General Robert C. Richardson, *Historical Review, Corps of Engineers, Vols I & II*, (Honolulu: U.S. Army Forces, Middle Pacific, 1946), Vol. I 332. Microfilm at Hamilton Library, University of Hawaii at Manoa.

²⁷ Bennett, *Oahu's World War Two 5-Inch*, 61

²⁸ *Ibid.*, 55.

²⁹ Lt. Col. Melbourne H. West, and Captain Lewis E. Claiborne, Jr., and 1st Lt. Charles W. Chestnut, "Report of Findings of Board of Officers," 12 May 1943. Memo in National Archives II, College Park RG 494.

³⁰ Bennett, *Oahu's World War Two 5-Inch*, 61.

U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 9)

C. Likely Sources Not Yet Investigated:

Additional records of the Hawaiian Department Engineer are located in Record Group 494, at the National Archives II, College Park, Maryland.

D. Bibliography:

Bennett, John D. "Oahu's World War Two 5-Inch Naval Antiaircraft Shore Batteries," *The Coast Defense Journal*, pp. 31-67, February 2007.

_____. Memorandum to Ann Yoklavich, Mason Architects. "Ford Island A.A. Site," 20 July 2007.

_____. Memorandum to Ann Yoklavich, Mason Architects. "Ford Island A.A. Site," 23 July 2007.

Borrecia, Richard. "Martial Law Held Sway in Isles for Three Years," *Honolulu Star Bulletin*, 13 Sept. 1999, on website: <http://archives.starbulletin.com/1999/09/13/special/story5.html>, accessed 26 Sept. 2007.

Campbell, John. *Naval Weapons of World War II*. Annapolis: Naval Institute Press. 1985.

Friedman, Norman. *US Naval Weapons: Every gun, missile, mine, and torpedo used by the U.S. Navy from 1883 to the present day*. Annapolis: Naval Institute Press. 1982.

Lewis, E.R. and D.P. Kirchner. "The Oahu Turrets," *Warship International*. Vol. xxix, No. 3, 1992.

Madsen, Daniel. *Resurrection: Salvaging the Battle Fleet at Pearl Harbor*. Annapolis: Naval Institute Press. 2003.

Mason Architects, Inc. *Historic Context Report and Historic Preservation Plan for World War II Defensive Accessory Facilities, Building Types Assessment: Splinterproof Shelters and Gun Emplacements*. Honolulu: Naval Facilities Engineering Command, Pacific. November 2004.

Richardson, Lt. General Robert C. *Historical Review Corps of Engineers, Vols. I & II*. Honolulu: U.S. Army Forces, Middle Pacific. [1946]. Microfilm at Hamilton Library, University of Hawaii at Manoa.

Thompson, Erwin N. *Pacific Ocean Engineers: History of the U.S. Army Corps of Engineers in the Pacific, 1905-1980*. U.S. Army Corps of Engineers. [1985].

Wallin, Capt. Homer N. "Report of Salvage of USS *West Virginia* (BB-48)." 15 June 1942. from website www.history.navy.mil/docs/wwii/pearl/salvagewv.htm, accessed on 17 October 2007.

U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 10)

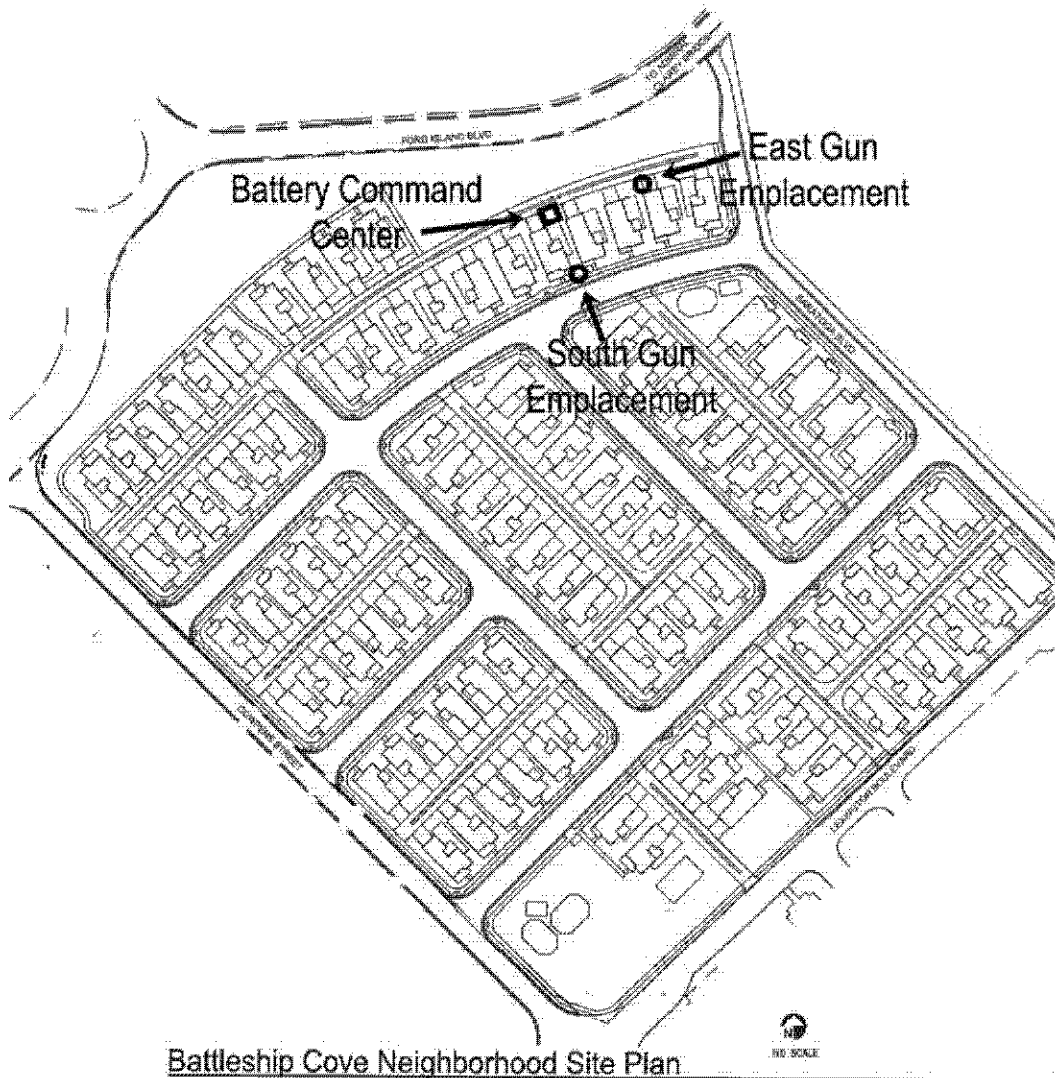
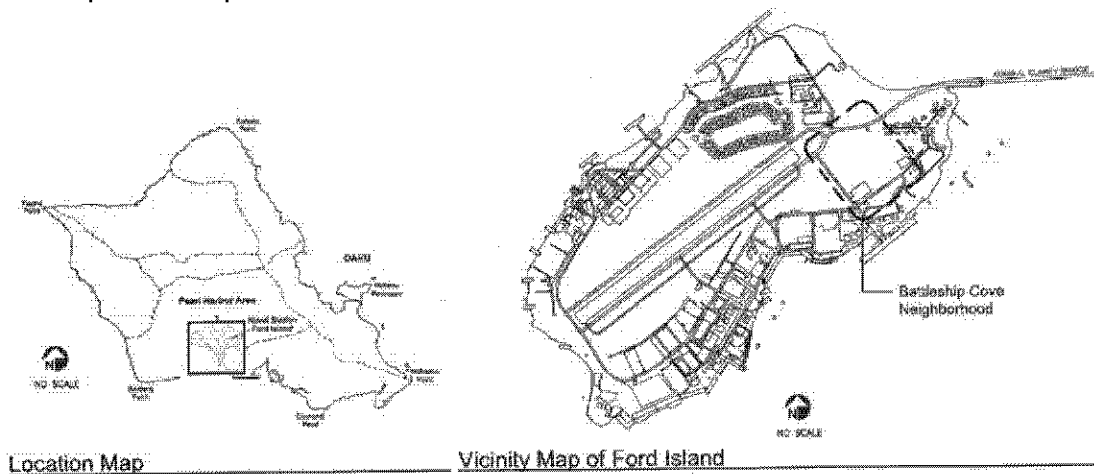
West, Lt. Col. Melbourne H., Capt. Lewis E. Claiborne Jr., and 1st Lt. Charles W. Chesnut.
"Report of Findings of Board of Officers," 12 May 1943 memo, from RG 494, National
Archives II, College Park, Maryland, provided by John Bennett.

PROJECT INFORMATION

This report was prepared to document the structures discovered and unearthed in March and April 2007 at Ford Island, Pearl Harbor National Historic Landmark, during the excavation phase of work to construct new military housing there. After recordation of the discoveries, the underground infrastructure that prompted their discovery was re-routed to avoid the structures and they were re-interred. All artifacts unearthed were placed back into the structures before they were covered. Large-format photography for this report was done in June 2007 by David Franzen of Franzen Photography, Inc. Field work and research were done by Dee Ruzicka and Ann Yoklavich, architectural historians with Mason Architects, Inc., in July and August 2007. John D. Bennett of Oahu, a frequent contributor to *The Coast Defense Journal* and a scholar of coast artillery in Hawaii, was consulted and provided information on the structures and on naval anti-aircraft shore batteries. Also, Tony DeGiulian, a naval weapons scholar and author of the website NavWeaps.com provided information regarding 5-inch/25 naval guns, mounts, and ammunition.

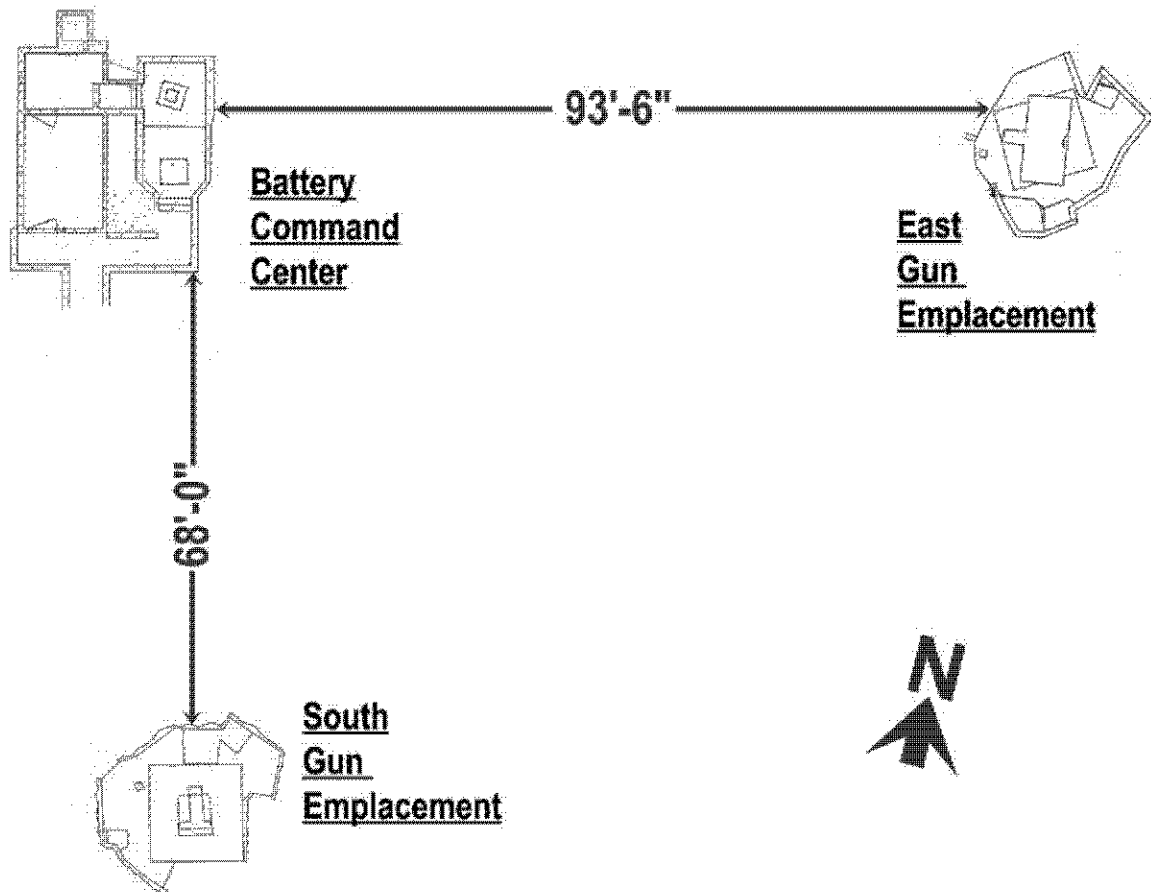
U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 11)

Location map and site plan.



U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 12)

Site plan showing the orientation of the three 5-inch antiaircraft battery structures discovered in March and April 2007, with the distances between them. No scale.



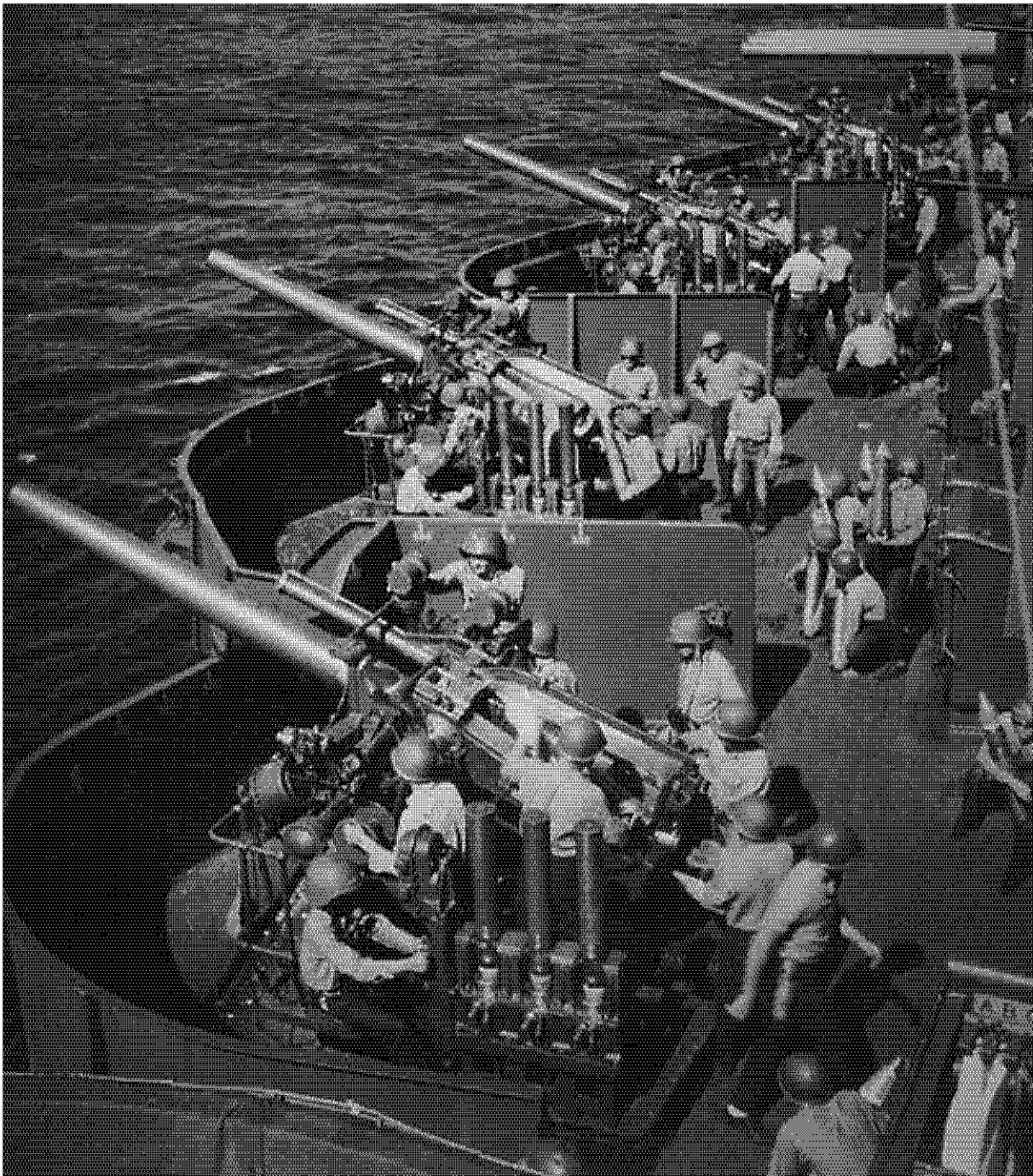
U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 13)

Portion of photograph dated January 15, 1943 showing the gun position (added arrow).
(Source: National Archives and Records Administration, photograph #80-G-451261).



U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 14)

Historic photograph showing 5-inch/25 guns on the USS *New Mexico* in June 1944. Mechanical fuse setters next to each gun hold three inverted rounds. The sailor assigned to be fuse setter at each gun is seated on the left (outboard end) of the machine.
(Source: U.S. Naval Historical Center, photograph 80-G-K-14162).



U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 15)

Historic photograph showing 5-inch/25 gun on the USS *Astoria* during gunnery practice in 1942.
Note the fired 5-inch/25 cases on the deck.

(Source: U.S. Naval Historical Center, photograph 80-G-21946).



U.S. NAVAL BASE, PEARL HARBOR,
FORD ISLAND 5-INCH ANTI-AIRCRAFT BATTERY
(U.S. Naval Base, Pearl Harbor, Naval Station Ford Island)
(Battery No. 7, Oahu 5-Inch Naval Antiaircraft Shore Batteries)
HAER No. HI-85 (Page 16)

Historic photograph showing 5-inch/25 gun being fired aboard the USS *New Mexico* in 1944. Note the round of fixed ammunition being placed into the gun's loading tray by the shell man. The pointer and trainer are each seated facing the target at opposite sides of the gun. The sight setter stands at the right side (above the trainer) observing his two dials in preparation for firing. (Source: NARA photograph in Friedman 1982, 63).

